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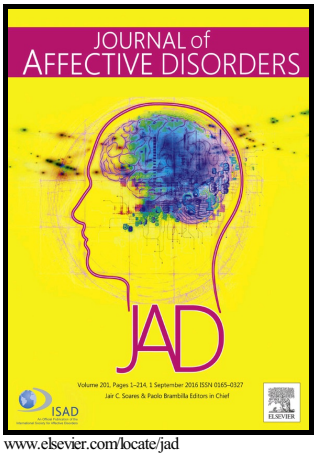

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An exploratory study of the heterogeneity of the jealousy phenomenon and its associations with affective temperaments and psychopathological dimensions in a large Brazilian sample

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Abstract

BACKGROUND: Jealousy is a heterogenous emotion on a spectrum from normality to psychopathology. The relationship between different jealousy subtypes/dimensions and affective temperaments remain unknown. In addition, few large surveys have investigated the associations between jealousy subtypes and psychopathological dimensions.

METHODS: A Brazilian Portuguese version of the "Questionario della Gelosia" (QUEGE) was developed. We obtained data from an anonymous web-based research platform. Socio-demographic data was obtained and participants answered the QUEGE, the TEMPS-Rio de Janeiro, and the Symptom Checklist-90-Revised (SCL-90-R).

RESULTS: 2042 participants (29 % men, 71% female, mean age + SD: 28.9 ± 8.8 years), took part in this survey. Confirmatory factor analysis provided a five-factor model for the QUEGE with self-esteem, paranoia, interpersonal sensitivity, fear of being abandoned, and obsessive dimensions. The anxious, irritable, cyclothymic, and depressive temperaments were independently associated with jealousy dimensions, whereas the hyperthymic temperament was associated with lower scores on the self-esteem jealousy dimension (N= 2042, $P < 0.001$). Jealousy subtypes were dissimilarly associated with SCL-90R psychopathological dimensions, whereas the 'obsessive' jealousy dimension was not significantly associated with SCL-90R dimension scores. We found no independent influence of gender across any jealousy dimension.

LIMITATIONS: A convenience web-based sample was employed. Cross-sectional design precludes the establishment of causal inferences.

CONCLUSIONS: Our data indicate that a five-factor solution may provide the best-fit model for the QUEGE. Different jealousy subtypes were independently associated with affective temperaments and psychopathological dimensions. These associations reported herein should be confirmed in prospective studies.

Keywords: affective temperaments; personality; jealousy; psychiatry; psychopathology; survey

1. Introduction

Jealousy is a complex and common emotion, which involves cognitive, emotional and behavioral reactions related to the threat of losing a loved one to a real or imaginary rival (Kingham and Gordon, 2004; Pfeiffer and Wong, 1989). Jealousy may have a genetic influence and play an evolutionary role enabling the propagation of one's own genes in detriment of those of a true rival (Harris, 2003; Walum et al., 2013). In accordance to the evolutionary psychological perspective, sexual dimorphic reactions to infidelity may occur, with men predominantly reacting to sexual infidelity, while women would more intensely react to emotional infidelity (Harris, 2003). However, some scientists adopt a social cognitive perspective, and argue that sex differences in the expression of romantic jealousy do not exist or otherwise could be explained by stereotypes about how each gender becomes engaged in a romantic relationship (Carpenter, 2012; DeSteno and Salovey, 1996; Harris, 2003). In addition, it is worthy to note that cultural aspects may also influence the expression of jealousy (Bhugra, 1993).

The so-called pathological jealousy encompasses a heterogeneous set of conditions commonly encountered in clinical practice (Kingham and Gordon, 2004; Seeman, 1979). The definition of pathological jealousy has varied across different historical periods according to limits and norms of what manifestations would be acceptable or not (Mullen, 1991). Furthermore, it has become increasingly clear that pathological jealousy is not a unitary phenomenon, and may occur in a continuum from within a 'normal range' through to delusional jealousy (Kingham and Gordon, 2004; Mullen, 1991). Jealousy may be a burdensome manifestation of several psychopathological conditions including but not limited to affective disorders (Kingham and Gordon, 2004), obsessive-compulsive spectrum disorders (Marazziti et al., 2003a; Parker and Barrett, 1997), alcohol use disorders (DiBello et al., 2015; Michael et al., 1995), psychotic disorders (Seeman, 1979; Soyka et al., 1991; Soyka and Schmidt,

2011), and also as a neuropsychiatric disturbance in neurodegenerative diseases (e.g., Parkinson's disease) (Cipriani et al., 2012; Perugi et al., 2013).

There are no precise boundaries between "normal" and "pathological" jealousy, and identifying this demarcation has been an elusive, if not an impossible task (Docherty and Ellis, 1976; Marazziti et al., 2010b; Mullen and Martin, 1994). Therefore, a dimensional approach has been increasingly adopted and may aid in the understanding of jealousy (Elphinston et al., 2011; Marazziti et al., 2010a; Marazziti et al., 2003b; Marazziti et al., 2010b; Pfeiffer and Wong, 1989). Marazziti et al. (2010b) developed the "Questionario della Gelosia" which we will refer to as the Jealousy Questionnaire (JQ). The exploratory factor analysis of the JQ in a sample 500 Italian university students revealed five subtypes/dimensions of jealousy namely self-esteem, paranoia, interpersonal sensitivity, fear of being abandoned, and obsessionality (Marazziti et al., 2010b). This underlying factor structure is yet to be confirmed in an independent sample.

Relatively few studies have investigated personality constructs that could be associated with jealousy. Buunk (1997) found an association between three types of jealousy (reactive, preventive, and anxious) and neuroticism, social anxiety, rigidity and hostility in a sample of 100 Dutch male and female subjects recruited through a national television announcement. Low self-esteem has also been related to jealousy (Mathes et al., 1985; Stieger et al., 2012). Costa et al. (2015) found that a small sample of individuals with pathological jealousy presented with higher scores in novelty seeking and harm avoidance and lower scores on self-directedness and cooperativeness in Cloninger's temperament and character inventory (TCI) dimensions (Cloninger et al., 1994) relative to controls. In addition, individuals with pathological jealousy had elevated trait impulsivity (Costa et al., 2015).

Affective temperaments may represent a heritable and relatively stable aspect of personality (Rihmer et al., 2010). Based on previous work from Kraepelin (1921) and

Kretschmer (1936), Akiskal and colleagues operationalized the concept of affective temperaments for research purposes with the definition of hyperthymic, cyclothymic, irritable, anxious, and depressive temperaments (Akiskal et al., 2005; Akiskal et al., 1998; Akiskal and Akiskal, 2005). Since then, accumulating evidence indicates that affective temperaments may influence creativity (Akiskal and Akiskal, 2007), and may also contribute to the emergence and modify the expression of affective disorders (Carvalho et al., 2013; Fountoulakis et al., 2016; Qiu et al., 2016), premenstrual dysphoric disorder (Camara et al., 2016), somatic symptoms (Hyphantis et al., 2013), and even suicidality (Baldessarini et al., 2016). Hence, the hyperthymic temperament may protect against suicidality, whereas the depressive temperament may increase suicidal risk (Serafini et al., 2011). To the best of our knowledge, no previous study has evaluated the association between affective temperaments and different subtypes/dimensions of jealousy.

The current study has three aims: (1) to develop a Brazilian Portuguese version of the JQ, and to investigate its factor structure in a large sample; (2) to explore associations between different jealousy dimensions and affective temperaments; and (3) to explore associations between psychopathological and jealousy dimensions.

2. Methods

2.1. Sample selection

Consecutive participants (N=2,153) were recruited through a large web-based Brazilian study (Portal Temperamento e Saúde Mental, www.temperamentoesaudemental.org). This website provides an encrypted and confidential platform for data collection, and was developed in a collaboration between the Federal University of Ceará (UFC) and the University of Fortaleza (UNIFOR). The research ethics committee of the Hospital Universitário Walter Cantídio approved the procedures for online data collection under the protocol number 1.058.252. To access

the surveys, participants were required to be at least 18 years old and asked to sign an electronic informed consent form. A number of validation questions throughout the protocol were employed to maximize the reliability of the data. This exploratory study included participants who had provided reliable responses to the attention and validation questions. From the initial sample, 2,153 participants answered the complete survey. After quality review, 2,042 subjects remained eligible and were included in the analyses (response rate: 94.8%). The mean ± SD age of the participants was 28.9 ± 8.8 years. The sample predominantly comprised of women (71.0%), while most participants were single (63.4%). Table 1 summarizes sociodemographic characteristics of the sample.

<Please insert Table 1 here>

This online survey collected sociodemographic data (age, gender, educational level, race, marital status, religious affiliation, occupation, and gross monthly income). In addition, this web-based platform included several validated psychological and psychiatric measures, including the jealousy questionnaire (JQ), the Temperament in Memphis Pisa and San Diego (TEMPS) instrument, and the Symptom-Checklist 90-Revised (SCL-90R). These measures are thoroughly described below.

2.2. Development of the Brazilian version of the JQ

A Brazilian Portuguese version of the JQ was developed in three steps: (1) translation from the original Italian version (Marazziti et al., 2010b) to Brazilian Portuguese by a bilingual mental health expert; (2) back-translation to Brazilian Portuguese by a bilingual mental health expert; and (3) semantic equivalence evaluation of the two versions by the author of the original instrument (DM). The version approved by the author was pre-tested in a convenience sample for transcultural adaptation (N=25). This pilot study was conducted at the Porangabuçu campus of the UFC. Subjects were students and/or employees who had completed high school; each

participant signed a written informed consent. The final version of the JQ is provided in the Supplementary online material that accompanies the online version of this article.

2.3. Measures

Jealousy was assessed with the JQ, which measures the frequency, duration and presence of feelings and behaviors related to jealousy. This instrument comprises 30 self-reported questions, answered in a 4-item Likert-dimension scale ranging from 1 (absence of feelings related to jealousy) to 4 (highest frequency or duration of those feelings). According to the original instrument jealousy is classified into 5 dimensions/subtypes: self-esteem/depressive jealousy, paranoia/paranoid jealousy, obsessionality/obsessive jealousy, fear of being abandoned/separation anxiety-related jealousy and interpersonal sensitivity (Marazziti et al., 2010b).

Affective temperaments were evaluated with the Brazilian Portuguese version of the Temperament Evaluation of Memphis, Pisa, Paris and San Diego (TEMPS-Rio de Janeiro) (Woodruff et al., 2011). The TEMPS-Rio de Janeiro was developed based on the original 110-version of the TEMPS-A (Akiskal et al., 2005) , and comprises 45 true or false questions assessing the cyclothymic, hyperthymic, anxious, depressive and irritable temperaments.

We used the Brazilian Portuguese version of the Symptom Checklist-90-Revised inventory (SCL-90R) to assess psychopathological dimensions (Carissimi, 2011; Derogatis and Melisaratos, 1983). Briefly, the SCL-90 R is a 90-item 5-point Likert-type inventory, which assesses several psychopathological dimensions namely somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism.

2.4. Statistical analysis

All analyses were carried out using Stata MP version 14.0 for Windows (StataCorp, USA). Continuous variables are presented as means ± standard deviations (SD). The Kolmogorov-Smirnov test was used to assess whether variables displayed a normal distribution. Categorical variables are presented as frequencies (%).

Exploratory factor analysis was carried out to analyze the structure of the JQ. Principal component analysis (PCA) with Oblimin oblique rotation was used to extract the factors. The scree plot was used to determine the number factors; items with factor loadings ≥0.3 were included in each factor (Johnson and Wichern, 2007). The factoriability of the correlation matrix was assessed with the Kaiser-Meyer-Olkin (KMO) statistic and the Bartlett's test for sphericity.

Confirmatory factor analysis (CFA) was then performed. We tested 6 different models. One 5-factor model corresponds to the factor structure that we obtained in our exploratory PCA considering only the items with loading factors > 0.3. For the second 5-factor model, we considered all items of the JQ; the highest factor loading (in PCA) of the item defined its inclusion in a given dimension. For the other models, we did additional factor analyses extracting only one, two, three or four factors, and chose the dimension according to the highest factor loading. We estimated the goodness-of-fit of each model with the chi-square (χ^2), the comparative fit index (CFI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). Although there is no absolute consensus in the literature, a RMSEA ≤ 0.06, a SRMR ≤ 0.09 and CFI ≥ 0.90 are considered acceptable (Browne and Cudeck, 1993; Hu and Bentler, 1999). To compare the different models, the Akaike information criterion (AIC) was used. Models with the lowest AIC are judged to fit the data better than alternative solutions (Akaike, 1974).

The internal consistency of the JQ was measured using Cronbach's alpha coefficient for the whole instrument and for each individual dimension, with a value ≥ 0.7 considered satisfactory (Nunnally and Bernstein, 1994).

The association of affective temperaments and the jealousy dimensions was evaluated using multiple linear regression models, adjusted by age, gender, and relationship status. Scores of each TEMPS temperament dimension were entered as predictor variables, and JQ dimension scores were the dependent (i.e., criterion) variables. Dimensional scores of the JQ comprised an average of individual items that loaded in each factor derived from PCA and CFA. Variance inflation factors (VIF) was used to check for multicollinearity, and values < 10 were deemed adequate (all VIF values were < 10; data available upon request). Associations between different jealousy subtypes and psychopathological dimensions were also assessed with separate multiple linear regression models, controlling for age, gender, and relationship status. Scores of each SCL-90R dimension were entered as dependent variables, while each jealousy dimension were entered as independent variables. Statistical significance was set at an alpha level of 0.05.

3. Results

3.1. Psychometric properties of the JQ

3.1.1. Principal component analysis

Using PCA, five factors were extracted according to the scree plot (Supplementary Figure S1), accounting, respectively, for 15.5%, 14.9%, 14.4%, 13.9%, and 8.3% of the variance of JQ scores (overall 67.0%). The KMO statistic (0.94) and the Bartlett's test of sphericity ($p < 0.001$) supported the factoriability of the JQ in our sample. Factor loadings of each individual item after Oblimin rotation are presented in Table 2. The first factor consisted of 6 items (1-6) and was considered as the 'obsessive' jealousy dimension. The second factor comprised 5 items of the JQ (14, 15, 17-19) and was regarded as the 'self-esteem' jealousy dimension. The third factor included 5 items of the JQ (26-30) and comprised the 'paranoid' jealousy dimension. The fourth factor referred to the 'interpersonal sensitivity' dimension and comprised 5 items (7-11). The

final factor was considered as 'fear of being abandoned/separation anxiety' jealousy dimension, and consisted of 4 items (12, 20-22). The items 13, 16 and 23-25 of the JQ did not load on any factor (i.e. factor loadings were all < 0.3).

<Insert Table 2 around here>

3.1.2. Confirmatory Factor Analysis

A 5-factor structure in which items with factor loadings < 0.3 in PCA were excluded provided the best model to fit our data. This model had the lowest AIC and the most consistent fit indexes (Table 3).

<Insert Table 3 around here>

3.1.2. Internal consistency reliability

The Brazilian Portuguese version of the JQ showed adequate internal consistency. Cronbach's alpha coefficient was 0.94 for the overall instrument, and 0.72–0.94 for each jealousy dimension/subtype.

3.2. Associations of jealousy dimensions and affective temperaments

Regression coefficients (standardized betas) for the associations of affective temperament dimensions and jealousy subtypes are presented in Table 4. The anxious and cyclothymic temperaments were independently associated with all jealousy dimensions. For the anxious temperament, the strongest association was with the 'obsessive' jealousy dimension. For the cyclothymic temperament, the strongest association was with the 'self-esteem' jealousy dimension. The hyperthymic temperament was negatively associated with the 'self-esteem' jealousy dimension. The irritable temperament was independently (and positively) associated with the 'obsessive', 'interpersonal sensitivity' and 'self-esteem' jealousy dimensions. The

strongest associations were with the 'obsessive' and 'interpersonal sensitivity' dimensions. Finally, the depressive temperament was independently associated with the 'paranoid', 'obsessive', 'fear of being abandoned' and 'self-esteem' jealousy dimensions. The strongest association was with the 'self-esteem' dimension. There was no independent effect of gender on jealousy dimensions (Table 4). Educational level had no significant influence on any jealousy dimension. In addition, the inclusion of this variable did not increment the explanatory power of any of the multivariable models (data available upon request). Thus, we did not adjust our results for this variable.

<Please insert Table 4 here>

3.3. Association of jealousy subtypes and psychopathological dimensions

Regression coefficients (standardized betas) for the associations of jealousy subtypes, controlling for age, gender, and relationship status and psychopathological dimensions are provided in Table 5. For this set of analysis, the sample comprised 1,970 participants since 72 did not answer the SCL-90R. 'Paranoid' jealousy was independently associated with phobic anxiety, depression, hostility, obsessive-compulsive, paranoid ideation, psychoticism, and interpersonal sensitivity dimensions; association with paranoid ideation was the strongest. 'Obsessive' jealousy was not significantly associated with any SCL-90R dimension. 'Interpersonal sensitivity' jealousy was not independently associated with phobic anxiety, hostility, interpersonal sensitivity, and somatization dimensions. The 'fear of being abandoned' jealousy dimension was significantly associated with phobic anxiety, anxiety, depression, hostility, obsessive-compulsive, paranoid ideation, psychoticism, interpersonal sensitivity, and somatization dimensions; association was strongest with depression. The 'self-esteem' jealousy dimension was significantly and independently associated with all SCL-R dimensions. Associations with the depression and interpersonal sensitivity dimensions were strongest (with beta values > 0.3). The variable educational

level had no significant effect on SCL-90R dimensions, and the inclusion of this variable did not improve the explanatory power of multivariable models (data available upon request).

<Please insert Table 5 here>.

4. Discussion

The present work confirms the proposed five-factor structure of the JQ in a large Brazilian sample. In addition, we found significant independent associations with different jealousy subtypes/dimensions with affective temperaments. Finally, our data suggest that different jealousy subtypes are dissimilarly associated with psychopathological dimensions.

4.1. The Brazilian Portuguese JQ and heterogeneity of jealousy

The JQ was initially developed to measure different jealousy dimensions in general population samples (Marazziti et al., 2010b). An exploratory factor analysis carried out in a convenience sample of 500 Italian University students suggested an underlying five-factor structure for the JQ. Herein we developed a Brazilian Portuguese version of the JQ. Our data confirmed its five-factor structure in a larger sample. In CFA, a five-factor solution in which the five items (13,16, 23, 24, and 25) with loadings < 0.3 in exploratory PCA yielded the best goodness of fit. Thus, these data suggest that a briefer 25-item JQ could provide a valid measure to capture jealousy dimensions in Brazilian samples. In addition, adequate internal consistency reliabilities were verified for each jealousy dimension as well as the overall JQ score. We found no independent influence of gender in any jealousy dimension. Thus, these data do not provide support for sexually dimorphic reactions to infidelity as proposed by evolutionary psychology theorists (Harris, 2003). However, our sample was predominantly composed by single young woman. Therefore, this finding deserves confirmation in a sample with different sociodemographic characteristics.

4.2. Associations of jealousy dimensions and affective temperaments

Our results indicate that the hyperthymic temperament was not associated with jealousy. On the contrary, this temperament seemed to protect against 'self-esteem' jealousy. Certain characteristics of the hyperthymic temperament may explain these findings. Hyperthymic individuals are often cheerful, over-confident and self-assured (Akiskal and Akiskal, 2005). In addition, the hyperthymic temperament may be associated with elevated self-esteem (Masmoudi et al., 2015). The anxious and cyclothymic temperaments were associated with higher scores in all jealousy dimensions. The anxious temperament was more strongly related to 'obsessive' jealousy. This finding is consistent with 'worrying' about one's kin (Akiskal and Akiskal, 2005). Therefore, anxious individuals may predominantly express an 'obsessive-ruminative' jealousy dimension. 'Falling in and out love' is an acknowledged characteristic of cyclothymic persons (Akiskal et al., 1977; Akiskal and Akiskal, 2005). These individuals may engage in intense and unstable relationships. Furthermore, the cyclothymic temperament is also characterized by extreme mood reactivity to interpersonal and separation sensitivity (Perugi et al., 2015). Hence, the cyclothymic temperament was more closely related to the 'fear of being abandoned' jealousy. The depressive temperament was more strongly associated with the 'fear of being abandoned' and 'self-esteem' jealousy, which seem consistent with the view that individuals with this temperament find security with harmonious relationships with significant others (Akiskal and Akiskal, 2005; Ueki et al., 2004).

4.3. Associations of jealousy subtypes and psychopathological dimensions

Our data indicate that different jealousy dimensions are associated with psychopathology. Our results indicate that 'obsessive' jealousy may be less consistently associated with psychopathology. It is possible that the JQ had captured a more 'worrying-ruminative' aspect of jealousy closer to the 'normal' end of the jealousy spectrum, which may occur at a somewhat high frequency in individuals without

obvious psychopathology. Our findings indicate that a dimensional (i.e., spectrum) approach to jealousy may be more appropriate than a dichotomous (normal versus pathological) perspective. However, different results could have emerged in a psychiatric (i.e., clinical population) population. For example, individuals with underlying personality disorder (such as paranoid personality disorder) could exhibit more severe forms of jealousy, with more obvious psychopathological implications.

In addition, the 'fear of being abandoned' and 'self-esteem' jealousy dimensions may be more consistently related to psychopathology. Furthermore, 'paranoid jealousy' was more strongly associated with psychoticism and paranoid ideation. These findings appear consistent with the hypothesis that individuals with high scores in this jealousy dimension may be more susceptible to present with delusional jealousy in the face of considerable distress. A previous study suggests that the DSM-IV-TR paranoid personality disorder could be a two-dimensional construct, including suspiciousness and hostility dimensions (Falkum et al., 2009). However, "accusations of infidelity of partner", which was related to the hostility dimension had poor indicator properties in this study. This diagnostic category (i.e., paranoid personality disorder) was removed from the 'Personality Disorders Chapter of the DSM-5' (Pull, 2013). Our findings suggest that 'paranoid jealousy' could be more dimensionally than categorically associated with suspiciousness in the general population. The 'interpersonal sensitivity' jealousy dimension seems similar to a condition referred to as "jealousie hyperestesique" a non-delusional form of jealousy also named "passionate jealousy" (Klein, 1954; Marazziti et al., 2010b), which may lie at the border between normal and pathological jealousy. Consistently, this jealousy subtype was more closely related to hostility and paranoid ideation.

4.4. Strengths and Limitations

Some limitations of this study warrant consideration. First, we enrolled a convenience web-based sample, which may not be representative of the Brazilian population. Our

survey had a predominance of young female participants. Second, the cross-sectional design of this study does not allow the establishment of causal inferences. In addition, our study was exploratory in nature. Third, the data herein obtained may not necessarily apply to other cultures. Strengths of this study include the enrollment of a relatively large sample, and the use of validated instruments. In addition, anonymous participation in the internet provides a setting with very low desirability bias to answer these instruments.

4.5. Conclusions

This study supports the notion that jealousy may be expressed in a heterogenous fashion in the general population. In addition, we found that the JQ may reliably quantify distinct facets of jealousy namely 'paranoid', 'obsessive', 'interpersonal sensitivity', 'fear of being abandoned', and 'self-esteem' dimensions. Jealousy dimensions were differently associated with affective temperaments. Finally, our findings indicate that jealousy may be better conceived as a dimensional phenomenon with psychopathological implications, but without clear borders demarcating 'normal' and 'pathological' jealousy. Prospective studies should be an important next step to elucidate directionality of the relationships we observed.

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Table 1. Sociodemographic characteristics of the sample (N=2,042).

Age, years (mean ± SD)	2,042	28.9 ± 8.8
Gender (n, %)		
Female	1,449	71.0
Male	593	29.0
Residence environment (n, %)		
Urban	2,018	98.8
Rural	24	1.2
Marital status (n, %)		
Single	1295	63.4
Married	369	18.1
Stable union	186	9.1
Divorced	84	4.1
Widowed	6	0.3
Other	102	5.0
Race (n, %)		
Caucasian	854	41.8
African American	140	6.9
Asian	11	0.5
Mulatto[a]	923	45.2
Other	114	5.6
Religion (n, %)		
Catholic	812	39.8
Protestant	306	15.0
Spirit (Kardecism)	165	8.1
Agnostic	394	19.3
Other	365	17.9
Educational level (n, %)		
Incomplete elementary school	3	0.2
Elementary school	9	0.4
Incomplete high school	35	1.7
High school	201	9.8
Incomplete university degree	921	45.1
University degree	387	19.0
Post-graduate degree	486	23.8
Employment status (n, %)		
Employed	1,048	51.3
Unemployed	604	29.6
Housewife	52	2.6
Retired	22	1.1
Other	316	15.5
Gross monthly income, USD (n, %)		

Less than 307	648	31.7
307 – 919	600	29.4
920 – 1,839	331	16.2
1,840 – 3,066	113	5.5
3,067 or above	101	4.9
Unknown/Not informed	249	12.2

[a] Refers to an ethnic group of mixed white and black ancestry

Table 2. Factor loadings after oblimin rotation for the 5 extracted components. Only factor loadings with absolute values ≥ 0.30 were retained.

Item	PC1	PC2	PC3	PC4	PC5
1	0.37				
2	0.41				
3	0.40				
4	0.43				
5	0.41				
6	0.39				
7				0.36	
8				0.44	
9				0.46	
10				0.37	
11				0.30	
12					0.30
13					
14		0.38			
15		0.38			
16					
17		0.45			
18		0.40			
19		0.46			
20					0.48
21					0.55
22					0.47
23					
24					
25					
26			0.43		
27			0.43		
28			0.43		
29			0.45		
30			0.46		
Eigenvalue	10.998	2.923	2.368	1.759	1.304
% Variance explained	15.5	14.9	14.4	13.9	8.3
Jealousy dimension	O	SE	P	IP	F

Abbreviations: F = fear of loss/separation-anxiety-related jealousy; IP = interpersonal sensitivity; O = obsessive jealousy; P = paranoid jealousy; PC = principal component; SE = depressive/self-esteem jealousy.

Table 3. Confirmatory factor analysis. Goodness-of-fit statistics for each model fitted against the sample data.

Model	χ^2	df	χ^2/df	CFI	RMSEA (95% CI)	SRMR	AIC
1-factor	19,546.3	405	48.3	0.527	0.152 (0.000 – undef)	0.112	138,885.9
2-factor	13,085.0	404	32.4	0.686	0.124 (0.000 – undef)	0.126	132,426.7
3-factor	7044.5	402	17.5	0.836	0.090 (0.088 – 0.092)	0.077	126,390.2
4-factor	4976.2	399	12.5	0.887	0.075 (0.073 – 0.077)	0.062	124,327.8
5-factor	4389.1	395	11.1	0.901	0.070 (0.069 – 0.072)	0.058	123,748.8
5-factor (loadings > 0.3)	2363.5	265	8.9	0.940	0.062 (0.060 – 0.065)	0.048	104,351.6

Abbreviations: AIC = Akaike information criteria; CFI = confirmatory factor index; CI = confidence interval; df = degrees of freedom; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual.

Table 4. Associations of affective temperaments and jealousy dimensions. Coefficients are presented for regression models of each TEMPS temperament scores.

Variable	Jealousy dimension				
	Paranoid	Obsessive	Interpersonal Sensitivity	Fear of being abandoned	Self-esteem
Affective temperaments					
Anxious	0.095 (<0.001)	0.151 (<0.001)	0.135 (<0.001)	0.079 (0.001)	0.117 (<0.001)
Hyperthymic	0.006 (0.787)	-0.003 (0.902)	0.017 (0.461)	0.019 (0.382)	-0.094 (<0.001)
Irritable	0.037 (0.120)	0.100 (<0.001)	0.157 (<0.001)	0.025 (0.296)	0.063 (0.005)
Cyclothymic	0.094 (<0.001)	0.065 (0.014)	0.071 (0.008)	0.121 (<0.001)	0.120 (<0.001)
Depressive	0.129 (<0.001)	0.083 (0.002)	0.026 (0.354)	0.245 (<0.001)	0.219 (<0.001)
In a relationship (0: No; 1: Yes)	-0.186 (<0.001)	0.004 (0.839)	0.040 (0.074)	-0.031 (0.154)	-0.128 (<0.001)
Gender (0: male; 1: female)	-0.019 (0.386)	0.030 (0.172)	0.013 (0.558)	-0.033 (0.130)	-0.024 (0.245)
Age (years)	0.004 (0.866)	-0.098 (<0.001)	-0.024 (0.279)	-0.033 (0.127)	-0.081 (<0.001)
Adjusted R^2 of the model	0.114	0.110	0.088	0.145	0.241
Significance of F change	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

Values presented as standardized beta coefficients (p value).

Note: In a relationship (=1) includes participants who are married or on a stable relationship. Statistically significant results are in bold.

Table 5. Associations of jealousy subtypes and psychopathological dimensions (N=1,970).

Variable	Psychopathological dimension								
	Phobic anxiety	Anxiety	Depression	Hostility	Obsessive-compulsive	Paranoid ideation	Psychoticism	Interpersonal sensitivity	Somatization
Jealousy dimension									
Paranoid	0.052 (0.038)	0.047 (0.052)	0.056 (0.015)	0.092 (<0.001)	0.084 (<0.001)	0.136 (<0.001)	0.108 (<0.001)	0.080 (<0.001)	0.018 (0.462)
Obsessive	0.011 (0.682)	0.044 (0.091)	-0.007 (0.780)	-0.013 (0.615)	0.028 (0.283)	-0.021 (0.420)	-0.012 (0.637)	0.022 (0.375)	0.030 (0.264)
Interpersonal Sensitivity	0.085 (0.001)	0.049 (0.051)	0.023 (0.327)	0.112 (<0.001)	0.017 (0.497)	0.116 (<0.001)	0.033 (0.174)	0.077 (0.001)	0.072 (0.005)
Fear of being abandoned	0.054 (0.035)	0.145 (<0.001)	0.193 (<0.001)	0.119 (<0.001)	0.112 (<0.001)	0.111 (<0.001)	0.156 (<0.001)	0.153 (<0.001)	0.072 (0.005)
Self-esteem	0.167 (<0.001)	0.234 (<0.001)	0.317 (<0.001)	0.170 (<0.001)	0.244 (<0.001)	0.234 (<0.001)	0.245 (<0.001)	0.308 (<0.001)	0.205 (<0.001)
In a relationship (0: No; 1: Yes)	0.005 (0.821)	0.038 (0.081)	-0.009 (0.676)	0.062 (0.006)	0.020 (0.378)	0.015 (0.492)	-0.055 (0.010)	-0.026 (0.206)	0.062 (0.006)
Gender (0: male; 1: female)	0.099 (<0.001)	0.075 (<0.001)	0.078 (<0.001)	0.021 (0.325)	0.041 (0.048)	-0.039 (0.055)	-0.036 (0.078)	0.057 (0.003)	0.164 (<0.001)
Age (years)	-0.095 (<0.001)	-0.070 (0.001)	-0.071 (<0.001)	-0.113 (<0.001)	-0.078 (<0.001)	-0.076 (<0.001)	-0.094 (<0.001)	-0.096 (<0.001)	-0.004 (0.842)
Adjusted R^2 of the model	0.106	0.180	0.258	0.149	0.164	0.207	0.217	0.287	0.125
Significance of F change	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

Values are presented as standardized beta coefficients (p value).

Note: In a relationship (=1) includes participants who are married or on a stable relationship. Statistically significant results are in bold.

HIGHLIGHTS

- Jealousy is a heterogeneous emotion ranging on a spectrum from normality to pathology;
- Jealousy dimensions were distinctly associated with affective temperaments;
- Anxious and cyclothymic temperaments were independently associated with all jealousy dimensions.
- Jealousy subtypes were also associated with psychopathological dimensions;
- A dimensional approach to jealousy may aid in the understanding of this phenomenon.